Yield of colonoscopy by indication and consequences for colorectal polyp and cancer screening

A prospective survey in Isère, France

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SUMMARY

Aim — The aim of this study was to determine yields of colonoscopy by indication, especially after a positive Hemoccult test, in the Isère area in southeastern France where a mass screening campaign for colorectal cancer using the Hemoccult test was conducted in women aged 50 to 69 years.

Method — This prospective survey was conducted with the participation of all gastroenterologists in the Isère department. Information about indications of all colonoscopies performed and their results were collected.

Results — The study involved 1,779 colonoscopies performed for: digestive symptoms (40%), surveillance of colon disease (22%), hematochezia (18%), a family history of colon cancer (10%), anemia, poor general condition or metastasis (4%), and a positive test for blood in the stool (3%). The presence of a pathological colon condition was significantly related to age (11% of cancers or large polyps after 50 years compared to 3% before), sex (10% of the women with lesions and 15% of the men) and the reason for prescription: after the age 50 a cancer or a large polyp was found in 27% of the cases if the colonoscopy was performed for anemia, metastasis or poor general condition, 21% for hematochezia, 20% for a positive test, 8% for digestive symptoms, and 2% because of a family history.

Conclusion — Positive Hemoccult tests represent only a small part of the indications for colonoscopies performed in the Isère department. However, the screening program should be extended to develop its use given its yield which is equivalent to that of hematochezia and much higher than that of digestive symptoms or family history.

Colorectal cancer is one of the most frequent cancers in France where 30,000 new cases are diagnosed each year [1]. Prognosis is still poor, with an estimated 5-year survival in Europe of 46% for colonic cancer and 43% for rectal cancer [2]. The natural history of these tumors includes a long pre-clinical phase during which resection of adenomas and early-stage cancerous tumors can reduce mortality. Colonoscopy provides excellent diagnostic yield and allows treatment of polyps and early-stage tumors. It is nevertheless an invasive and costly technique which must be properly used. Attention must be drawn to determining which indications provide the best diagnostic yield for early-stage neoplasia.

A screening program for cancer managed by the local anti-cancer office (ODLC, Office départemental de lutte contre le Cancer) was initiated in the French department of Isère in 1990 [3]. This program was designed for women aged 50 to 69 years who were invited to undergo screening tests for breast cancer and, exceptionally, during the same consultation, screening tests for cervical and colorectal cancer. Screening for colorectal cancer included a Hemoccult test which was distributed by the primary care physician and read at a specialized center. The screening protocol excluded patients at risk (personal or familial history of colorectal cancer, or recent development of digestive symptoms) or patients who had recently undergone a colonoscopic exploration. Colonoscopy was proposed if the Hemoccult test was positive (2.4% of the cases) and was accepted by 79% of the subjects. In this program, colonoscopies performed after a positive Hemoccult led to the diagnosis of suspect polyp in 5% of the patients and overt cancer in 11%. More than half of these cancers were early-stage (54% TNM0 and 1 versus 23% in the general female population aged 50 to 69 years) [3]. The purpose of the present study was to assess the yield of colonoscopy for the diagnosis of suspected cancerous tumors and polyps by indication for exploration, particularly after a positive Hemoccult test.

Materiel and methods

A prospective survey was conducted with the participation of gastroenterologists working in private practices and in hospitals in the Isère department of France (38 practitioners). The survey included all colonoscopies performed during a seven-week period in June and July 1996 in subjects over the age of 20 years. The gastroenterologists completed questionnaires at the time of the colonoscopy recording patient information (age, sex), the origin of the prescription (specialty of the doctor), the indications of all colonoscopies performed and their results were collected.
prescribing practitioner), indications for colonoscopy, and results. Indi-
cations were classed in 8 categories: family history of colorectal cancer,
personal history of gynecological cancer (breast, uterus), follow-up
examination after a colorectal disease (cancer or polyp, rectocolitis,
Crohn’s disease), hematochezia, positive Hemoccult test during the
screening campaign or positive fecal occult blood test (in subjects who
had not participated in the ODLC screening program and for whom the
gastroenterologist did not necessarily have information on the type of test
used, Hemoccult or other), pain and intestinal motricity disorders, poor
general health or search for primary tumor in patients with metastasis,
and other indications. Colonoscopy findings were classed in 4 categories:
normal or abnormal benign, polyp(s) measuring less than 10 mm, polyp(s)
measuring more than 10 mm, apparently malignant tumor, or
inflammatory colitis (Crohn’s disease, rectocolitis). Pathology findings on
biopsy and polypectomy specimens were not considered for this study.

The questionnaire included a list of items and had been tested earlier
in a pilot study conducted in two colonoscopy centers. Data were
collected and processed at the ODLC.

Statistical analysis

SPSS was used for statistical analysis. All questionnaire items were
analyzed as unique responses (after recoding multiple response items).

Univariate analysis using the chi-square test was applied to identify
factors correlated with colonoscopy results. Factors found to be significant
at univariate analysis were retained for the logistic regression model.

Results

Population

During the study period, 1,779 colonoscopies were per-
formed in 966 women (54%) and 813 men (46%), mean age 59
years (range 20-98). Seven percent of these explorations were
performed in subjects aged over 80 years and 30% in subjects
under 50 years (12% 20-39 years, 18% 40-49 years) (figure 1).

Prescribing physicians

The specialty of the prescribing physician was known in all
but 2 cases. Prescribers were general practitioners (50.3% of the
colonoscopies), gastroenterologists (42.3%), surgeons (6.3%)
and gynecologists (0.6%, 1.1% of the colonoscopies performed
in women).

Indications

By order of decreasing frequency, colonoscopies were
prescribed for: digestive symptoms (40%, including 3% associ-
ated with familial history), follow-up for colonic disease (22%),
hematochezia (18%), family history of colorectal cancer (10%),
anemia, poor general health status or metastasis (4%), positive
stool test (Hemoccult or other test, 3%), personal history of
gynecology cancer (breast or ovary, 1%), other reason (2%).

Nineteen percent of the colonoscopies in subjects aged 40 to
50 years were performed because of a familial history of
colorectal cancer; this percentage was 2% in subjects over 70
(table I).

Positive stool tests was a minority indication. The highest
percentages (6.0 and 5.4%) were observed in subjects in the
50-59 and 60-69 age groups respectively; these percentages
were higher in women (7.5% and 6.2% respectively) which
constituted the target population for the screening program. A
positive stool test was the reason for performing the colonoscopy
in 3 subjects over 80 (2.4%).

Colonoscopy results

The colonoscopic examination was incomplete in 10 cases
(0.6%). Results from 1,769 complete colonoscopies were
retained for analysis. No abnormality was identified in 1,206 cases
(68.1%) and a polyp measuring less than 10 mm was identified in
345 (19.5%). Eighty-one polyps measuring = 10 mm (4.6% of the
colonoscopies) and 73 apparently malignant tumors (4.1%) were
diagnosed. Finally inflammatory colitis was observed in 64 cases
(3.6%).

Three categories of colonoscopy results were retained for
analysis: normal (normal, polyp = 10 mm or benign disease),
suspected malignancy (polyp = 10 mm or apparently malignant
tumor including 53% of the polyps identified and 47% of the
tumors identified), and inflammatory colitis. The colonoscopies
were normal in 90.0% of the women and 84.9% of the men
(P < 0.001).

Indications for colonoscopies which led to the diagnosis of
inflammatory colitis were limited: either monitoring of a known
colic disorder, probably of the same type, or hematochezia or
other digestive disorder (pain, motricity disorder).

Diagnosis of malignancy (colorectal cancer or polyp = 10
mm) exhibited a different frequency depending on the type of
indication for colonoscopy (P < 0.001). Malignancy was diag-
nosed in a very small percentage of subjects who underwent the
procedure because of a family history of colorectal cancer
(1.1%). This percentage was higher for colonoscopies performed
for digestive disorders (5.6%), or an association of family history
and digestive disorders (8.3%). Higher percentages of malignant
diagnoses was found in subjects who underwent colonoscopy
because of anemia, poor general health or metastasis (20.6%),
positive fecal occult blood test (18.3%), bloody stools (14.1%), or
history of gynecology cancer (13.6%). Recurrence was observed in
10.2% of the subjects who underwent colonoscopy as part of
their surveillance program for colonic disease. The rate of
discovery of polyps = 10 mm and of apparently malignant tumors
was higher in subjects over 50 years of age (P < 0.001). For

Fig. 1 – Distribution of colonoscopies by age, sex and prescriber. Prospective study in Isère, France (June-July 1996).
younger subjects, colonoscopic diagnosis of malignancy was reported in 2.6% of the subjects. The rate of colitis was however higher in these younger subjects (7.9%) (figure 2).

More than 90% of the apparently malignant tumors or polyps = 10 mm were found in subjects aged 50 years and older. In this subset of the population, colonoscopy demonstrated tumorous lesions or polyps = 10 mm in 21% of the subjects examined for hematochezia and in 20% of those with a positive Hemoccult test. Diagnosis of colorectal lesions was less frequent in colonoscopies performed for family history or digestive disorders (table II).

At multivariate analysis, three factors (age, sex, and reasons for prescribing colonoscopy) contributed significantly to the explanation of the colonoscopy result (table III). Disease states were identified twice as frequent in men as in women and increased in both sexes after 50 years. Discovery of a disease state was 4 times more frequent in subjects over 70 than in those under 40. Colonoscopy results were different depending on the indication for colonoscopy; polyps = 10 mm and apparently malignant tumors were discovered 16 and 14 times more frequently during colonoscopies performed for anemia, poor general health and metastasis and for positive Hemoccult test than for those performed because of a familial history of colorectal cancer.

Discussion

The colonoscopies reported in this series are probably representative of the colonoscopy activity in the Isère area of France in 1996 since all gastroenterologists working in private practice and in hospitals in the area participated in the study and included all patients aged over 20 years who underwent colonoscopy during the two-month study period.

The frequency of colorectal cancer detection depends greatly on indications for colonoscopy. A review of the literature published in 1996 by Rex [4], showed that on the average cancer is discovered in 11% of the colonoscopies performed for hematochezia and in 10% of those with a positive fecal occult blood test (non-rehydrated stools). In our study, cancers and large polyps were found in 21% and 20% of the colonoscopies performed for these indications in subjects over 50 years of age; in this subset of the population, 48% of the observed anomalies were cancers. These rates are higher than observed during the

Table I. – Reasons for prescription of colonoscopies. Prospective study in Isère France (June-July 1996).

<table>
<thead>
<tr>
<th>Reasons for prescription</th>
<th>20-39 years</th>
<th>40-49 years</th>
<th>50-59 years</th>
<th>60-69 years</th>
<th>70-79 years</th>
<th>+ 80 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family history of colorectal cancer</td>
<td>19</td>
<td>63</td>
<td>59</td>
<td>32</td>
<td>8</td>
<td>2</td>
<td>183</td>
</tr>
<tr>
<td>Personal history of gynecology cancer</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Monitoring colonic disease</td>
<td>32</td>
<td>50</td>
<td>77</td>
<td>120</td>
<td>84</td>
<td>24</td>
<td>386</td>
</tr>
<tr>
<td>Hematochezia</td>
<td>50</td>
<td>62</td>
<td>66</td>
<td>72</td>
<td>40</td>
<td>24</td>
<td>314</td>
</tr>
<tr>
<td>Positive Hemoccult test</td>
<td>22.8 %</td>
<td>19.0 %</td>
<td>17.1 %</td>
<td>17.1 %</td>
<td>13.2 %</td>
<td>19.0 %</td>
<td>17.7 %</td>
</tr>
<tr>
<td>Positive fecal occult blood test</td>
<td>0</td>
<td>0.3 %</td>
<td>3.9 %</td>
<td>3.3 %</td>
<td>1.3 %</td>
<td>0.7 %</td>
<td>1.9 %</td>
</tr>
<tr>
<td>Digestive symptoms</td>
<td>94</td>
<td>112</td>
<td>128</td>
<td>140</td>
<td>124</td>
<td>51</td>
<td>649</td>
</tr>
<tr>
<td>Digestive symptoms and family history</td>
<td>14</td>
<td>11</td>
<td>17</td>
<td>7</td>
<td>8</td>
<td>4</td>
<td>61</td>
</tr>
<tr>
<td>Search for primary cause (anemia, poor general health)</td>
<td>14</td>
<td>11</td>
<td>17</td>
<td>7</td>
<td>8</td>
<td>4</td>
<td>61</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td>6</td>
<td>14</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>TOTAL</td>
<td>219</td>
<td>326</td>
<td>421</td>
<td>302</td>
<td>302</td>
<td>126</td>
<td>1 779</td>
</tr>
</tbody>
</table>
screening campaign (16%) [3], possibly because the campaign was targeted to women aged 50-69 years while the present study included men and subjects over 70. The positive predictive value of positive fecal occult blood tests for cancer has varied from 8-17% in the Funen study [5], to 10-17% in the Nottingham study [6] and 8-16% in the Burgundy study [7].

According to Rex’s analysis [4], other indications for colonoscopy frequently leading to discovery of colorectal cancer are presence of digestive disorders (2.8%), and surveillance after treatment for colorectal cancer (2.7%); diagnosis of cancer is made in only 0.7% of colonoscopies performed because of family history. In our series, diagnosis of cancer or polyps ≥ 10 mm was made in 7.5, 11.1 and 2.0% of the colonoscopies performed for the corresponding indications.

These results demonstrate the diagnostic yield of colonoscopy performed after hematochezia or a positive Hemoccult test. For Hemoccult screening to be effective, all subjects with a positive test must undergo colonoscopy, but earlier reports have shown that colonoscopy is actually performed in only 79-86% of them [3, 5-8].

Table II. – Results of colonoscopies according to indications (men and women over 50). Prospective study in Isère, France (June-July 1996).

<table>
<thead>
<tr>
<th>Reason for colonoscopy</th>
<th>Normal or polyp &lt; 10 mm</th>
<th>Polyp ≥ 10 mm or apparently malignant tumor</th>
<th>Inflammatory bowel disease</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family history of colorectal cancer</td>
<td>99%</td>
<td>2</td>
<td>0</td>
<td>101</td>
</tr>
<tr>
<td>Personal history of gynecology cancer</td>
<td>12%</td>
<td>3</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Monitoring colonic disease</td>
<td>266%</td>
<td>34</td>
<td>5</td>
<td>309</td>
</tr>
<tr>
<td>Hematochezia</td>
<td>147%</td>
<td>42</td>
<td>10</td>
<td>199</td>
</tr>
<tr>
<td>Positive fecal occult blood test (Hemoccult or other test)</td>
<td>73.9%</td>
<td>21.1%</td>
<td>5.0%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Digestive symptoms (pain, motricity disorders)</td>
<td>402%</td>
<td>33</td>
<td>5</td>
<td>440</td>
</tr>
<tr>
<td>Digestive symptoms and family history</td>
<td>91.4%</td>
<td>7.5%</td>
<td>1.1%</td>
<td>35.9%</td>
</tr>
<tr>
<td>Search for cause (anemia, poor general health, metastasis)</td>
<td>94.3%</td>
<td>5.7%</td>
<td>2.9%</td>
<td>35</td>
</tr>
<tr>
<td>Other</td>
<td>28%</td>
<td>1</td>
<td>0.4%</td>
<td>41</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.063%</td>
<td>140</td>
<td>21</td>
<td>1224</td>
</tr>
</tbody>
</table>

Table III. – Risks of polyp ≥ 10 mm and malignant tumor at colonoscopy according to age, sex and indication. Multivariate analysis. Prospective study in Isère France (June-July 1996).

<table>
<thead>
<tr>
<th>Odds-ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex Women</td>
<td>1</td>
</tr>
<tr>
<td>Men</td>
<td>1.96</td>
</tr>
<tr>
<td>Age 20-39 years</td>
<td>1</td>
</tr>
<tr>
<td>40-49 years</td>
<td>0.58</td>
</tr>
<tr>
<td>50-59 years</td>
<td>2.34</td>
</tr>
<tr>
<td>60-69 years</td>
<td>3.16</td>
</tr>
<tr>
<td>70-79 years</td>
<td>4.15</td>
</tr>
<tr>
<td>80 years and over</td>
<td>4.39</td>
</tr>
<tr>
<td>Motif Family history of colorectal cancer</td>
<td>1</td>
</tr>
<tr>
<td>Personal history of gynecology cancer</td>
<td>11.65</td>
</tr>
<tr>
<td>Monitoring colonic disease</td>
<td>6.48</td>
</tr>
<tr>
<td>Hematochezia</td>
<td>12.30</td>
</tr>
<tr>
<td>Positive fecal occult blood test (Hemoccult or other)</td>
<td>14.46</td>
</tr>
<tr>
<td>Digestive symptoms</td>
<td>3.96</td>
</tr>
<tr>
<td>Digestive symptoms and family history</td>
<td>1.53</td>
</tr>
<tr>
<td>Search for cause (anemia, poor general health)</td>
<td>16.38</td>
</tr>
<tr>
<td>Other</td>
<td>8.05</td>
</tr>
</tbody>
</table>
The notion of family history was examined in the 1998 consensus conference that detailed the degree of parenthood and the age of the family member with colorectal cancer [9]. Family members are considered to have a high risk of colorectal cancer if they have a first degree relative with colorectal cancer before the age of 60 years. We have no data on these notions in our study so it is possible that the subjects who had a family history of colorectal cancer (10% of the colonoscopies) may have included a certain number without these risk criteria.

The presence of digestive disorders is a leading indication for colonoscopy: 40% of the explorations in our series. Earlier work on colonoscopy indications [10, 11] have also found a predominance for digestive disorders, though the percentages have been lower (25 et 30%). The recommendations of the French national agency for the development of medical evaluation (ANDEM, currently designated as ANAES Agence Nationale pour l’Accréditation et l’Évaluation des Soins) and the American Society for Gastrointestinal Endoscopy (ASGE) reserve colonoscopy indications for patients with recent digestive symptoms [12, 13]. Many explorations are actually performed for chronic digestive disorders, which could explain the predominance of this indication and its poor diagnostic yield for detection of large polyps and cancer.

The incidence of colorectal cancer is low in subjects under 50 years of age. Consequently colonoscopy rarely leads to the diagnosis of cancer of high-risk polypl (2.6%) while the diagnosis of inflammatory colitis is frequent (7.9%). For this subset of the population, colonoscopy cannot be recommended except for subjects with a high or very-high risk or in order to monitor inflammatory bowel disease [9, 12].

In conclusion, this study comparing the diagnostic yield for detection of colorectal cancer of colonoscopy performed for different indications demonstrated that positive Hemoccult screening tests are among the best indications. In addition, the randomized trials conducted in Funen, Nottingham and Burgundy have demonstrated a lower mortality due to colorectal cancer in populations screened with the Hemoccult test [5, 6, 14]. Implementation of screening programs should thus reorient prescriptions for colonoscopy toward indications with a higher diagnostic yield, for example digestive disorders. Another survey similar to the present one conducted in 1996 would be helpful in determining the impact of the 1998 Consensus Conference on current practice.

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Références